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Simplex lattice design for the optimization of the microencapsulation of a water soluble drug using poly(lactic acid) and poly(lactide co-glycolide) copolymer.

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An emulsion solvent evaporation technique was applied to prepare microspheres of nicotinic acid as a water soluble vitamin. Poly(lactic acid) of two molecular weights, 2000 and 100,000 and poly(lactide-co-glycolide) (50:50) of molecular weight 18,000 were used. A simplex lattice design with the aid of a computer program was applied to study the effect of the previously mentioned polymers on different characteristics of the prepared microcapsules. The studied characteristics included the yield, the percentage drug loading and the particle size of microcapsules. Microcapsules were examined by light microscope for particle size determination and by electron scanning microscope for surface morphology characterization. The release pattern of the drug from the microcapsules was evaluated on the basis of the burst effect, the rate of release and the extent of release after 24 h. A model equation was developed to be the best representation of the relationship between the above polymers and the measured characteristics. The goodness of fit of the developed equations was checked, both statistically and experimentally. The release of the drug from microcapsules mainly followed the Higuchi diffusion model. Polylactic acid of a molecular weight 100,000 had the most pronounced delaying effect on the release rate of the drug. However, polylactic acid of a molecular weight 2,000 showed the highest improvement effect on the yield and the drug loading

characteristics of the microcapsules. Poly(lactide-co-glycolide) copolymer exhibited the lowest burst effect and the most steady drug release pattern.

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